POSTER SESSION

1216 Computer Applications: Cardiac Imaging and Physiologic Modeling

Tuesday, March 19, 2002, 3:00 p.m.-5:00 p.m.
Georgia World Congress Center, Hall G
Presentation Hour: 4:00 p.m.-5:00 p.m.

1216-164 The Digital Echocardiography Lab Has Arrived: Direct Comparison of Digital Versus Video Readings in 100 Patients

Jennifer Pennimpede, Lori B. Croft, Eric H. Stern, Tamanna Nahar, Samantha Buckley, Justine Carneglia, Robert Shapiro, Martin E. Goldman, *Mt. Sinai Medical Center, New York, New York.*

Background: Videotape (Video) has been the standard medium for reviewing and storing echo studies. Recently, digital archiving has been proposed as the new and improved method for echo review and storage. While videotape can record continuously, digital loops must be selected individually throughout the exam on non-streaming systems to be stored. **Methods:** To determine whether digital reading would be equivalent in quality and review time to video, we acquired and read 100 routine, random patient studies acquired by 4 different technologists on both video and digital storage. We used a commercially available digital storage system, KinetDx® (Acuson), with 2 cardiac cyles/loop. The video and digital studies were read in alternating sequence (51 digital read first). The time for reading each mode, comparison of quality, missed diagnoses and number of loops stored by tech and edited for storage by M.D. were recorded. **Results:** The primary referring diagnosis was to assess LV function (58%). When read first, the video study took 6.25 ± 1.98 minutes to review, compared to 3.01 ± 1.29 minutes for the digital to be read first and edited ($p<.0001$). When read second, the video study took 4.75 ± 1.80 minutes compared to 2.38 ± 1.14 minutes for the digital ($p<.0001$). There were 3 major diagnoses missed by video, 6 by digital (p=N.S.). Irregular rhythms created gating problems for digital acquisition, even if we defaulted to time acquisition. The average number of loops stored by a technician was 63±20 which was reduced by 28% for storage while the M.D. reviewed the study. Additionally, the total time for digital echo reading and editing for archiving took less than 50% of the time to read video. Study quality was equivalent. **Conclusion:** Thus, digital acquisition and editing on a commercially available system can significantly reduce reading and reviewing time without loss of study quality.

1216-165 Real-Time Expert-Guided Remote Echocardiography Is an Accurate Clinical Tool

Girish A. Narayan, David Liang, Bob Hu, *Stanford University Hospital, Stanford, California.*

Background: With the availability of portable echo machines, echocardiography is increasingly being used to provide point-of-care diagnosis. Remote real-time interpretation and guidance of these procedures by experienced echocardiographers may be important in ensuring diagnostic accuracy. We examined the accuracy of analyzing live, remote echocardiograms transmitted over a network using standard internet protocol. In a subset of these patients, we also assessed the feasibility of remotely guiding image acquisition. Methods: Patients were serially studied in the Stanford Echocardiography laboratory using the SonoHeart (SonoSite) and Agilent 5500 scanners. A home-grown system was used to capture and stream video output of the scanner across the internet to a remote reader for interpretation. The results (REMOTE) were compared with an official blinded gold-standard interpretation (STAN) of the actual study. In a subset of patients, the entire imaging study was performed by following specific verbal instructions on probe movement from the remote reader. Results: The patient data was analyzed for LV function, wall motion abnormalities, and valvular diseases. The agreements between REMOTE and STAN were computed using a weighted kappa statistic. Global LV function was correctly identified in all patients (kappa = 1). Good regional wall motion agreement was also obtained (kappa = 0.60). Valvular morphology agreement was also high (kappa = 0.60). Excellent agreement was noted in the degree of valvular regurgitation (kappa = 0.90). In the subset of patients whose studies were guided remotely, an average lagtime between local image acquisition and remote display of 10-16 seconds was observed. Conclusion: Real-time expert-observed and guided point-of-care echocardiography is highly accurate compared with conventional echocardiography. This may allow the echocardiography expert to provide quality diagnosis over the internet. Current image delivery latency represents a tolerable annoyance--this issue is being addressed in the new nationwide Internet-2 initiative.

1216-166 Remote (At-Home) Interpretation of Digital Echocardiographic Studies via a DSL Internet Connection

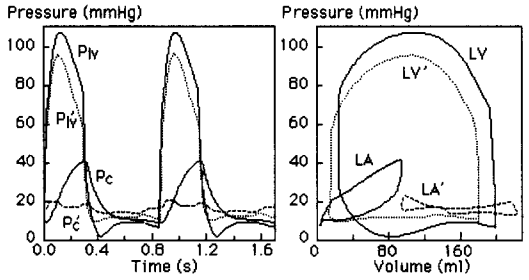
Kirk T. Spencer, Aravind Herle, Jeanne M. DeCara, Roberto M. Lang, *University of Chicago, Chicago, Illinois.*

Background. Digital echocardiographic platforms allow the rapid storage, retrieval and review of images. In addition, digital studies can be transmitted electronically. However, the transmission of clinical echocardiographic studies has been limited by the lack of telecommunications software and inadequate transmission line speeds. We tested a new medical imaging application service provider solution in conjunction with high speed internet connection to evaluate the feasibility of reading echocardiographic studies from physicians' homes. Methods: Twenty subjects with urgent indications for echocardiography were enrolled. Subjects had digital echo loops acquired to optical disk. Studies where uploaded to a remote server via the internet using the Telemedix service (Global Telemedix, Westford, MA). Studies where then interpreted a) locally and b) remotely (from physician home 26 miles from hospital). Remote review of images was performed using the same software to access the server via a DSL line. Results. Uploading patient studies (6-10 loops) to the remote server was simple and took 6.1±3.3 minutes. Images were automatically "pushed" from the server to the remote home computer avoiding the need to wait for image download. Remote study review lasted 2-3 minutes. Remote interpretation of the echo studies was equivalent to the local reading for assessment of LV function, pericardial effusion and regional wall motion in all 20 patients. One patient had a discrepancy in the assessment of RV function. Conclusions. When using prototype software and a high-speed DSL line, remote (at home) interpretation of echocardiographic studies is feasible and accurate. This technology allows remote consultation and expert echocardiographic interpretation at all hours. This may prove most useful for the urgent echocardiographic evaluation of patients when an expert reader is not available on-site.

1216-167 Reduction of Mitral Regurgitant V Wave by Biventricular Pacing Is Due to Acute Increase in Left Atrial Compliance and Not Improved Atrioventricular or Interventricular Synchrony: A Model-Based Study

Salvatore A. Chiaramida, Ying Sun, *Medical University of South Carolina, Charleston, South Carolina, University of Rhode Island, Kingston, Rhode Island.*

Background: Previous studies have demonstrated reduction or elimination of the V-wave in the pulmonary capillary wedge pressure (Pc) in patients with mitral regurgitation (MR) treated with biventricular pacing (BVP). Methods: We utilized a previously presented hemodynamic model of the circulatory system to assess the mechanisms of the reduction of MR V-wave by BVP. The ventricular contractility and compliance were held constant to eliminate the effect of intraventricular synchronization by BVP. Results: The computer simulation demonstrated no effect of altering atrioventricular or interventricular synchrony on the magnitude of the V-wave. A systematic analysis further showed that the V-wave is mainly affected by the left atrial (LA) compliance. As shown in figure, for a regurgitant mitral valve area of 1 square-cm, V-wave reduces in magnitude dramatically when the LA compliance is increased (Pc to Pc'). However, disappearance of V-wave is not associated with reduction of regurgitant flow; the pressure-volume loops indicate that both left ventricular hydraulic work and stroke volume decrease. Conclusions: The model study showed that acute increase of LV compliance is likely the mechanism of V-wave reduction by BVP, not interventricular or atrioventricular synchrony.



ORAL CONTRIBUTIONS

877 Quality Assessment in Management of Arrhythmias

Tuesday, March 19, 2002, 4:00 p.m.-5:00 p.m.
Georgia World Congress Center, Room 267W

4:00 p.m.

877-1 Decreasing Risk of Sudden Cardiac Death: A Role for Both Primary and Secondary Prevention

Caroline Fox, Jane Evans, Martin Larson, William Kannel, Daniel Levy, *NHLBI's Framingham Heart Study, Framingham, Massachusetts.*

Background: A decline in coronary heart disease (CHD) mortality in recent decades has been widely acknowledged. However, it is not known if there has been a parallel decline in the risk of sudden cardiac death (SCD).
Methods: We examined temporal trends in SCD in the Framingham Heart Study original cohort and offspring cohort from 1950 to 1999. SCD was defined as the onset of death with preceding symptoms lasting less than 1 hour; a physician panel adjudicated all deaths. Log-linear Poisson regression was used to estimate risk ratios (RR) for each subsequent decade compared with 1950-1969; RR were age-and-sex adjusted.
Results: Overall, there were 438 SCD (319M/119F). Of these, 199 were in subjects free of CHD, and 239 were in subjects with CHD or congestive heart failure (CHF). The RR and 95% confidence intervals are shown in the table by time period with 1950-1969 serving as the referent period.
Conclusions: These data show that the overall risk of SCD has decreased by 50% since 1950. This trend is evident both in subjects with and without CHD, suggesting important contributions of primary and secondary prevention in the decreasing risk of SCD.